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ONR Summer Scholars for the 1992 PREFACE Program

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Smith, Mark D.

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17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Pre-college; Engineering Enrichment Academic Summer Program

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

PREFACE, a two-week residential program for disadvantaged students, women and members of ethnic minority groups historically underrepresented in scientific, technological and engineering professions, will celebrate its fifteenth summer program in 1992. PREFACE is designed to facilitate a broader and deeper understanding of engineering and related professions, career options, and the kinds of competencies and expectations of engineering faculty and professionals on the collegiate and practioner levels. The most unique feature of PREFACE is its linking the development of engineering professionals (theoretical) and the practice and application of engineering and scientific principles (practical). Participants have the opporutnity to learn what engineering is from experts in the various fields of engineering and observe how princples of engineering are applied in industrial and research settings. This summer experience serves to clarify the kinds of knowledge and skills essential to successfully complete an engineering degree.

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19. ABSTRACT (Continued)

Participants are selected from a nation-wide pool of paplicatns and spend two weeks on the Rensselaer Campus attending lectures, demonstrations, visiting research and industrial facilities, learning interactive computer graphics using ProEngineer applied to solving an engineering problem, and interacting with faculty, engineering professionals, Rensselaer undergraduate / graduate students and peers. These experiences provide a valuable base from which to plan appropriate academic coursework during their senior year in high school, clarify what engineering is and how it is applied to solving 'real-world' problems, and realize that engineering and related professional careers are within one's grasp.

The Office of Naval Research supports twenty (20) participants as "ONR Scholars" for the two-week program.

FINAL TECHNICAL REPORT

Office of Naval Research
Agreement No. N00014-92-J-1638
RPI Project No. 6-28140

The PREFACE Program is a two-week residential summer program designed to provide an introduction to engineering experience for members of ethnic minority groups. women and disadvantaged students historically underrepresented in the engineering professions. There were twenty-nine participants in the 1992 PREFACE Program; twenty of which were designated ONR Scholars (Appendix I, Enrollment Profile). There were 357 applicants in this year's pool, lower than previous years as we experience a decline in interest in science and engineering professions and a smaller pool of students in the Class of 1993. Despite this decrease in the applicant pool, Rensselaer was accepted thirty-five students to yield twenty-nine participants for the 1992 PREFACE Program. Of the 29 participants, nine (9) were African American, six (6) Latino, twelve (12) Caucasian, and one (1) Native American. There were twenty-three (79%) female and six (21%) males, which is consistent with previous years. There were fourteen states represented by the participants. The largest number of participants were from New York (10), followed by Maryland (3), then Texas, Colorado, Florida and Puerto Rico each with two participants, and Illinois, Maine, Michigan, Mississippi, North Dakota, Rhode Island, Vermont, and Washington each with one participant. It is gratifying to note that we are able to generate considerable interest in PREFACE on a national scale.

Academically, participants' average on the SAT-Verbal was 529 and SAT-Math was 594 combined SAT average of 1123, exceeding the national average. These scores are consistent with the quality of young people attracted to the PREFACE Program. Participants' secondary school performance exceeded our expectations. Of the 29 participants, 23 were from public high schools, 5 from private secondary schools, and 1 from a state-wide, residential science and technology high school (Illinois). For the 1992 participants, their collective high school average was 3.90 / 4.00 scale; average high school rank in class was 94.2 %tile with 17 participants ranked in the top 10 of their high school classes. Overall, this class was exemplary by virtue of their selection for PREFACE and enthusiasm for learning they brought to the program.

The principal goals of PREFACE were to facilitate a broader and deeper understanding of engineering professions, career options, and the kinds of competencies and expectations of engineering faculty and professionals on the collegiate and practitioner levels. To this end, participants were exposed to a range of activities, lectures and discussions relevant to developing appropriate connections between the sciences, mathematics, engineering and practical applications of knowledge to solving real-world problems (APPENDIX II, PREFACE Program Schedule). The intention and focus of the collective experience was to demonstrate by example and description the diversity of scientific and engineering professions, the linkage between academic and practical application of knowledge, and the importance of developing style of problem solving consistent with and appropriate for the solution of novel and undefined problems. Participants had a unique opportunity to clarify their own goals and interests by exploring with experts in their respective fields the kinds of knowledge and problem solving skills critical to successfully meeting the demands and expectations of a rigorous engineering curriculum.

Historically, PREFACE participants have had the opportunity to explore the application of computer graphics to address a problem situation while learning to use sophisticated software in an engineering environment. This year participants used ProEngineer to design an attachment device to hold the auxiliary air breather to a scuba divers body so it will not drag across the sea bottom getting caught on rocks or coral. Participants worked in teams to design and construct an actual working model of an attachment device for scuba divers. Examples of their work and reports are attached in Appendix V. This experience enabled participants to have a greater understanding of the 'engineering process' by demonstrating the process from problem formulation and definition through the design and reporting of a potential solution. Two designs were selected and a model constructed using the computer-aided manufacturing (CAM) laboratory.

Each summer, PREFACE participants visit a major research and development center to observe and interact with principal scientists and engineers. The intent of this visit is to obtain a more intimate and representative view of doing science and engineering in the 'real world' working on practical problems. This year's visit was to the Naval Air Warfare Center, Warminster, Pennsylvania. Dr. J. J. DeLuccia coordinated the visit and provided introductory remarks and

orientation to the center. Participants visited five laboratories ranging from research on ceramic materials to rust inhibitors. Each laboratory provided a hands-on demonstration of the research being done, rationale for exploring the problem situation, and important commercial applications of the solution to the problem(s) being researched. Participants were impressed with the nature of the research endeavors and potential commercial applications. More importantly, participants were able to discuss why and how the individual scientists and engineers chose to focus on these topics, their educational background and training, and its relevance to working in these laboratories. Participants also visited the Franklin Institute, a hands-on science museum, located in Philadelphia.

Participants in the 1992 PREFACE Program were able to demonstrate a strong motivation toward developing the kinds of skills and knowledge appropriate for pursuing careers in engineering, the sciences and technological professions. Each participant, on their evaluation of PREFACE, indicated an increased resolve and confidence in their ability to acquire and apply knowledge toward engineering and related professions. The success of PREFACE is based on the capability and commitment of faculty and staff at Rensselaer to provide high quality academic and support services to participants in the summer experience. This commitment continues to be demonstrated as participants successfully complete the program and enter prestigious colleges across the nation. All twenty-nine (29) participants chose to be interviewed by Rensselaer's Undergraduate Admissions staff while in attendance for the summer program. Nineteen have applied to Rensselaer and 8 have been accepted as of January, 1993. It should be noted that seventeen (17) 1991 PREFACE Program participants were admitted to Renselear for the Fall 1992; six of which are currently attending. Of the six, two were awarded $10,000 scholarships from IBM for four years. The principal reason for choosing Rensselaer as their college of choice remains their participation in PREFACE. We look forward to the continued success of the PREFACE Program in the years to come.

SUMMARY OF RESULTS FROM THE PREFACE PROGRAM SURVEY

Each year a survey of participants is conducted to assess project effectiveness and services (APPENDIX IV, 1992 PREFACE Program Evaluation Form). In general, participants find the program to be extremely helpful in facilitating their understanding of engineering and science on

the college level. Of the 29 participants, 80% rated the Academic and Team Competition components as excellent opportunities to learn about engineering, computing and science processes. The Field Trips and Social/Cultural Events were rated as excellent/good for all participants. The following comments represent the majority opinions of the participants:

> This has been a very valuable experience for me. It has answered a lot of questions and made me realize the potential us "women" really do have in a challenging career. (Jessica Michel, Livermore Falls High School, Fayette, ME)
>
> I believe this (PREFACE) has been very educational and informative I have had an experience these past two weeks that will stay with me for the rest of my life. (Melissa Dellith, Oneonta High School, Oneonta, NY)
>
> .... the exposure I got from PREFACE of actual, hands on engineering and computing gave me a much clearer understanding of the kind of engineer I hope to be. (Nneka Hanshaw, Oxford High School, Oxford, MS)
>
> This (PREFACE) was a wonderful opportunity to receive a detailed introduction to engineering as well as a meaningful look at the different perspectives of science / engineering that were generated the past two weeks. This is unequivocally one of the most memorable experiences of my life. (Meredith Morgan, Champlain Valley Union High School, Shelburne, VT)

This assessment demonstrates the impact and success of the PREFACE experience. Each participant states that participation in PREFACE enables them to attain a higher level of achievement, increased perseverance, and improved self-confidence to pursue their dream of a career in an engineering, scientific or technological profession. In comments regarding the project activities, all felt that having lecture/demonstrations, tours of research facilities, and visits to practicing engineers in industrial settings, significantly clarified and enhanced their understanding of scientific, technological and engineering careers in a way that could not have occurred without participation in PREFACE. Participants declared that, had he/she to do it all over again, he/she would attend PREFACE. The comments and rate of response are gratifying and demonstrate the success of the Program.

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SUMMARY OF EXPENDITURES

ONR SUMMER SCHOLARS FOR 1992 PREFACE PROGRAM

Agreement No. N00014-92-J-1638
RPI Project No. 6-28140

	ONR FUNDS (20)	RPI CONTRIBUTION (9)	TOTAL (29)
PROFESSIONAL PERSONNEL			
Project Director (M. Smith)	n/c	n/c	n/c
Dorm Director (O. Portugues)		$ 1,500.00	$ 1,500.00
Tutor Counselors (5 @ $600.00 each)	$ 1,800.00	1,200.00	3,000.00
Computer Graphics Support (J. Linz)	1,000.00		1,000.00
TOTAL, PROFESSIONAL PERSONNEL	$ 2,800.00	$ 2,700.00	$ 5,500.00
FRINGE BENEFITS (23.5 %)	n/a	$ 141.00	$ 141.00
TOTAL, FRINGE BENEFITS		$ 141.00	$ 141.00
OTHER DIRECT COSTS			
Participant Support Costs -			
Room: $ 68/wk x 29 students x 2 wks.	$ 2,720.00	$ 1,224.00	$ 3,944.00
Board: $ 135.70/wk x 29 students x 2 wks.	5,428.00	2,442.00	7,870.00
Travel: $ 372/student x 29 students	7,438.00	3,347.00	10,785.00
Books & Supplies: $ 138 x 29 students	1,614.00	2,387.00	4,001.00
Computer Usage: $ 93/stud. x 29 students		2,687.00	2,687.00
Health Fee: $ 13.50/student x 29 students		391.00	391.00
Staff Support Costs -			
Room: $ 73/wk x 3 wks. x 4 Staff		960.00	960.00
Board: $ 74/wk x 3 wks x 4 Staff		950.00	950.00
Postage, Telephone & Duplication Costs		1,435.00	1,435.00
TOTAL, OTHER DIRECT COSTS	$17,200.00	$15,824.00	$33,024.00
INDIRECT COSTS	n/a	n/a	n/a
TOTAL PROJECT COSTS	**$20,000.00**	**$18,665.00**	**$38,665.00**

PREFACE PROGRAM COST PER STUDENT: $ 1,333.28

TOTAL, PROJECT COSTS: **$ 38,665.00**

APPENDIX I

1992 PREFACE PROGRAM

OFFICE OF NAVAL RESEARCH SCHOLAR ROSTER

NAME	STATE	SEX	ETHNICITY
Brown, Michelle	WA	F	C
Caraballo, Anita	CO	F	H
Dellith, Melissa	NY	F	C
Faniyi, Joy	MD	F	B
Gehrke, Kelly	ND	F	C
Hanshaw, Nneka	MS	F	B
Jones III, Ernest	MD	M	B
Lee, Cherri	NY	F	NA
Lorenzo, Aaron	FL	M	H
Morgan, Meredith	VT	F	C
Rios, Francisco	TX	M	H
Rodriguez, Mara	PR	F	H
Russell, Amy	IL	F	H
Shelley, Felicia	TX	F	B
Somers, Joseph	FL	M	B
Takatani, Sarah	NY	F	AA
Travier, Damien	NY	M	B
Tyler, Kelly	RI	F	B
Weir, Barbara	NY	F	C
Williams, NuRocha	NY	F	B

NOTE: (B) African American; (H) Hispanic; (C) Caucasian; (AA) Asian American; (NA) Native American/Alaskan Native

APPENDIX II

PREFACE Program Schedule
July, 1992

MONDAY, JULY 13

8:30 - 9:00 **SA 2715**	Orientation Dr. Paul Derusso, Associate Dean, School of Engineering Mr. Norman Burnett, Associate Dean of Students and Director of the Office of Minority Student Affairs
9:00 - 10:00 **SA 2715**	Computer Lecture John Kolb, Director, Engineering Computing Services (ECS)
10:00 - 11:00 **CII 3130/JEC 3210**	Computer Session--Introduction to RCS Workstations
11:00 - 12:00 **CII 3051**	Discussion: Civil Engineering Mr. Robert Dunn, Civil Engineering
12:00 - 1:00 **BARH Dining Hall**	Lunch
1:00 - 2:00 **CII 3045**	Computer Graphics Lecture: Pro/ENGINEER Hugo Walpurgis, CAD/CAM Engineer, ECS
2:00 - 3:15 **CII 3130/JEC 3210**	Computer Session: Pro/ENGINEER Hugo Walpurgis, CAD/CAM Engineer, ECS
3:30 - 4:30 **CC 308**	PHYSICS Magic Show Annette Orlitelli, Department of Physics
5:00 - 6:00 **BARH Dining Hall**	Dinner
6:00 - 8:00 **CII 3130/JEC 3210**	Computer Session: Pro/ENGINEER Hugo Walpurgis, CAD/CAM Engineer, ECS
9:00 - 10:00 **BARH**	Group Meeting

TUESDAY, JULY 14

8:30 - 9:00 **SA 2715**	Group Meeting
9:00 - 10:00 **SA 2715**	Computer Lecture: MATLAB Nabil Hijazi, Lead Consultant, ECS

10:00 - 12:00 **CII 3130/JEC 3210**	Computer Session: Introduction to MATLAB
12:00 - 1:00 **BARH Dining Hall**	Lunch
1:00 - 2:30	Tour of LINAC Center Elaine Belokopitsky, Nuclear Engineering
2:45 - 4:00 **CII 3045**	Professional School Orientation: Dean Donald Watson, School of Architecture Dr. Michael Halloran, Associate Dean, School of Humanities & Social Sciences Dr. Barry Taylor, Director of Student Programs, School of Management
4:00 - 5:00 **CII 3130/JEC 3210**	Computer Lecture & Session: MATLAB .m Files Nabil Hijazi, Lead Consultant, ECS
7:00 - 8:30 **CC 337**	Meet the Administration Dr. Lee Wilcox, Vice President for Student Affairs Dr. Alan Meltzer, Professor of Physics & Director, Rensselaer Learning Center
8:30 - 9:30 **BARH**	Ice Cream Social

WEDNESDAY, JULY 15

8:30 - 9:00 **SA 2715**	Group Meeting
9:00 - 10:00 **SA 2715**	Computer Lecture: BBN/Slate Spreadsheets Debra Wentorf, Technical Writing Assistant, ECS
10:00 - 11:00 **CII 3130/JEC 3210**	Computer Session: Using MATLAB Data In BBN/ Slate Spreadsheets
11:00 - 12:00 **SA 2715**	Discussion: Electrical and Computer Systems Engineering Dr. Bruce Carlson, Electrical, Computer, & Systems Engineering
12:00 - 1:00 **BARH Dining Hall**	Lunch
1:00 - 2:15 **CC 308**	Chemistry Lecture / Demonstration Dr. Robert Reeves, Chemistry Department Linda Rickus, Chemistry Department
2:30 - 3:30 **MRC 148A**	Tour of Materials Engineering Laboratory Dr. Roger Wright, Professor of Materials Engineering

3:30 - 4:30 **Union Shellnut Gallery**	Lecture: Group Participation and Organization Linda McCloskey , Director, Center for Student Leadership Jane Watson, Director, Student Activities
4:30 - 5:30 **CII 3130/JEC 3210**	Computer Session: Introduction to BBN/Slate Word Processing & Graphics Debra Wentorf, Technical Writing Assistant, ECS
7:00 - 8:30 **BARH**	Admission and Financial Aid Dean Eddie Knowles, Dean of Students, Rensselaer Mr. Tyrone Jordan, Associate Dean of Admissions and Financial Aid Ms. Lucia Alcantara, Assistant Dean of Admissions and Financial Aid Ms. Ginny Crotty, Associate Director of Financial Aid
8:30 **BARH**	Pizza Party

THURSDAY, JULY 16

8:30 - 9:00 **SA 2715**	Group Meeting
9:00 - 10:00 **SA 2715**	Computer Lecture: Group Project Assignment Hugo Walpurgis, Engineering Computing Services Debra Wentorf, Engineering Computing Services
10:00 - 11:00 **CII 3130/JEC 3210**	Computer Session: Sample Report Simulation
11:00 - 12:00 **CII 3051**	Problem Solving: Thinking To Learn Mark Smith, Assistant Dean of Students/Director of Academic Support Programs
12:00 - 1:00 **BARH Dining Hall**	Lunch
1:00 - 3:30 **CII 3130/JEC 3210**	Computer Session
5:00 PM	**Departure for *NAVAL AIR WARFARE CENTER***

FRIDAY, JULY 17

9:00 - 2:00	**Naval Air Warfare Center, Aircraft Division Warminster, PA**

SATURDAY, JULY 18

SUNDAY, JULY 19

MONDAY, JULY 20

8:30 - 9:00
SA 2715
Group Meeting

9:00 - 10:00
SA 2715
Computer Lecture: Group Project Meetings
All Instructors

10:00 - 11:00
CII 3130/JEC 3210
Computer Session: Pro/ENGINEER
Hugo Walpurgis, CAD/CAM Engineer, ECS
[Groups will rotate out for shop sessions]

11:00 - 12:00
CII 3051
Discussion: Mechanical Engineering
Dr. Richard Smith, Associate Professor of Mechanical Engineering

12:00 - 1:00
BARH Dining Hall
Lunch

1:00 - 2:00
CII 3045
Discussion - Biomedical Engineering
Dr. Jonathan Newell, Professor of Biomedical Engineering

2:00 - 3:00
CII 3045
Computer Lecture: Group Project Meetings
All Instructors

3:00 - 5:00
CII 3130/JEC 3210
Computer Session: Group Projects -- Proposal
All Instructors

6:00 - 8:00
CII 3130/JEC 3210
Computer Session: Group Projects -- Proposal
All Instructors
** PROPOSALS DUE BY THE END OF SESSION **

TUESDAY, JULY 21

8:30 - 9:00
SA 2715
Group Meeting

9:00 - 10:00
SA 2715
Computer Lecture: Group Project Meetings, Questions & Discussion
All Instructors

10:00 - 12:00
CII 3130/JEC 3210
Computer Session: Group Projects -- Begin Design
All Instructors

12:00 - 1:00
BARH Dining Hall
Lunch

1:00 - 2:00
CII 3045
Tour of Mechanical Engineering Laboratory
Dr. Richard Smith, Associate Professor of Mechanical Engineering

2:30 - 3:00
CII 3045
Discussion: Aeronautical Engineering and Space Technology
Dr. Robert Loewy, Professor of Mechanical Engineering, Aeronautical Engineering & Mechanics and Director, Rotocraft Technology Center

WEDNESDAY, JULY 22

8:30 - 9:00
SA 2715
Group Meeting

9:00 - 10:00
SA 2715
Computer Graphics Lecture
Hugo Walpurgis, Engineering Computing Services
Debra Wentorf, Engineering Computing Services

10:00 - 12:00
CII 3112
Session on Computer Graphics

12:00 - 1:00
BARH Dining Hall
Lunch

1:00 - 2:00
CII 3045
Discussion: Industrial and Management Engineering
Dr. Jorge Haddock, Professor of Industrial and Management Engineering

2:00 - 3:00
CII 3045
Tour: Center for Industrial Innovation and Center for Integrated Electronics
Dr. Christopher LeMaistre, Director, CII & CIE

5:00 - 6:00
Rensselaer Union
Steak Bar-B-Q: Faculty, Students, Guests and Staff

THURSDAY, JULY 23

8:30 - 9:00
SA 2715
Group Meeting

9:00 - 11:30
Walker Lab 307
CHEMISTRY COMPETITION
Mark Smith, Assistant Dean of Students/Director of Academic Support Programs

11:30 - 12:15
CII 3130/JEC 3210
Computer Session: Group Projects -- Work Time
All Instructors

12:15 - 1:00
BARH Dining Hall
Lunch

1:00 - 2:00
CII 3130/JEC 3210
Computer Session: Group Projects -- Work Time

2:00 - 5:00
General Electric--Silicones Division, Waterford, NY
Environmental Engineering, Chemical Engineering, and Waste Water Management Departments

FRIDAY, JULY 24

8:30 - 9:00
SA 2715
Group Meeting

9:00 - 12:00 **CII 3130/JEC 3210**	Computer Session: Group Projects -- Work Time All Instructors ** GROUP WRITTEN REPORTS DUE BY NOON **
12:00 - 1:00 **BARH Dining Hall**	Lunch
1:00 - 2:30 **CII 3045**	Center for Manufacturing Productivity & Advanced Technology: Computer Simulation
3:00 - 4:30 **CII 3130/JEC 3210**	Computer Session: Course / Instructor Evaluations All Instructors
6:30 - 9:00 **SAGE Dining Hall**	FAREWELL BANQUET & GRADUATION

SATURDAY, JULY 25

DEPARTURE FOR HOME !!!!

APPENDIX III

LIST OF POSTSECONDARY INSTITUTIONS ATTENDED BY PREFACE PROGRAM PARTICIPANTS

(1987-92 PREFACE PROGRAM PARTICIPANT SURVEY)

Cooper Union
Columbia University
Georgia Institute of Technology
George Washington University
University of Michigan
Carnegie Mellon University
Rensselaer Polytechnic Institute
Carleton College
Harvard University
Stanford University
Texas A & M University
Massachusetts Institute of Technology
University of California - Berkeley
Johns Hopkins University
SUNY-Buffalo
Virginia Tech
Rice University
University of Virginia
University of Missouri - Kansas City Medical School
Florida State University
University of Alabama
Princeton University
Iowa State University
University of Southern California
Duke University
Northwestern University
U.S. Military Academy
U.S. Naval Academy
U.S. Air Force Academy

APPENDIX IV

1992 PREFACE PROGRAM EVALUATION

NAME _____

ADDRESS _____
Street City State Zip Code

1. Using the scale given below, assess each session attended during the PREFACE Program based on your perception of its value to yourself and the class in general. Write the number from those listed in the scale on the blank alongside each session.

SCALE

(1) Excellent
(2) Good
(3) Poor Presentation, but Important Information
(4) No value, drop from the program

a. Academic Component

_____ Computer Lectures and Sessions on the Terminals

_____ Aeronautical Engineering

_____ Civil Engineering

_____ Tour of LINAC, Nuclear Engineering

_____ Admission and Financial Aid Information Session

_____ Electrical, Computer and Systems Engineering

_____ Chemistry Lecture/Demonstration

_____ Materials Engineering Laboratory

_____ Problem Solving: Thinking to Learn

_____ Mechanical Engineering

_____ Biomedical Engineering

_____ Physics Magic Show

_____ Industrial and Management Engineering

_____ Center for Manufacturing Productivity & Advanced Technology - Computer Simulation

SCALE

(1) Excellent
(2) Good
(3) Poor
(4) No Value, drop from the program

b. Field Trips

_____ Naval Air Warfare Center , Philadelphia, PA

_____ Franklin Institute of Science & Technology , Philadelphia, PA

c. TEAM Competitions

_____ Chemistry Laboratory Competition

_____ Computer Design Project

_____ Egg Drop

_____ Marble Launch

c. Social/Cultural Events

_____ Ice Cream Social

_____ Pizza Party

_____ Steak Bar-B-Q

_____ Farewell Banquet

In items 2 - 5, comment on your views of the PREFACE experience, its strengths and weaknesses and recommendations for change in future years. Your comments, suggestions and critique of your PREFACE experience will influence the planning and revision for the 1993 PREFACE Program.

2. Based on your experiences during PREFACE, describe the strengths of the program.

3. Based on your experience during PREFACE, describe any weaknesses in the program.

4. Reflecting on your experience during PREFACE, what recommendations or changes would you suggest for the program that would improve and/or make it more meaningful for future participants?

5. If you had it all to do over again, would you choose to attend PREFACE at RPI? Why or why not?

EDUCATION PLANS:

Name of college/university you plan to apply for Fall, 1993: _____

What is your intended major? _____

What is your career goal? _____

APPENDIX V

PREFACE PARTICIPANTS' PROJECT TEAM REPORT -- AN EXAMPLE

INVENTIVE SCUBA GEAR MODIFICATION

****

Group #8

Shelly Shea

Nneka Hanshaw

July 24, 1992

DESIGN SUMMARY

Underwater diving is a sport that many people enjoy. However, as with any other type of sport, danger often accompanies the pleasure. The alternate regulator that divers use which is attached to the air tank hangs dangerously low and becomes a potential hazard. As a result, a clip has been designed to place on the side of the alternate regulator so that it will hook on to the front of the diver's air jacket. In addition to the reasons for designing the clip, how we designed it benefits not only the divers themselves but also other divers as well.

This clip has been designed for several reasons. First and foremost, it gives divers a place to put their alternate regulators. Keeping the air hose from getting tangled in sea obstacles is yet another reason. Third, the mouthpiece avoids being torn and damaged which ultimately means money spent to fix it. Finally, it puts the alternate regulator in a highly visible, accessible area.

Another important aspect of the clip is how it is designed. The clip is attached to the side of the mouthpiece with a waterproof epoxy. The clip itself is made out of hard plastic which seems to hold up better than metals in any type of water. The general shape of the clip favors that of a walkman's. This new design, however, has a curved, ribbed interior to create a stronger hold to keep the entire apparatus from dropping off the diver's jacket upon his/her entry into the water. It is not, however, so strong that it won't come off in an emergency.

This revolutionary concept benefits not only the divers themselves but other divers also. The divers who have experienced the problem of the alternate regulator dragging heretofore won't have to worry about that problem anymore. When the clip is properly used, it reduces the risk of destroying the mouthpiece and possibly even the air hose. Moreover, easy access is of major importance to the diver in need of air, and this device secures its availability.

The reasons for designing the clip, the design itself, and the benefits could make the difference between a safe dive and a dangerous one. With the new clip in place, divers can free up their minds to take in more of nature's underwater world. This new device ultimately makes that possible.

PROBLEM STATEMENT

The alternate regulator on scuba diving suits often presents a problem to divers. The tube trails behind the divers and latches on the surrounding sea environment causing potential hazards. In the following report, my collegue and I have devised what we feel is a working solution to this predicament.

ASSEMBLY INSTRUCTIONS

1. Form a clip from plastic in the shape shown in the following diagrams. The plastic must be slightly flexible but sturdy enough to withstand the weight of the regulator and additional forces such as any drag from the diver's motion and/ or underwater sea pressure.

2. Attach the clip to the mouthpiece at the location marked with an X on Figure: 4 with an epoxy glue. The epoxy should be a strong adhesive, and it should be waterproof.

3. The clip will attach to any of the availabe buckles on the air vest. This will allow the diver to determine the most comfortable location of the regulator, and safety will still be maintained.

BILL OF MATERIALS

Reference #	Quantity	Part Designation	Material	Note
1	1	clip	plastic	----
2	1	glue material	epoxy	epoxy is waterproof
3	1	buckle	aluminum	----

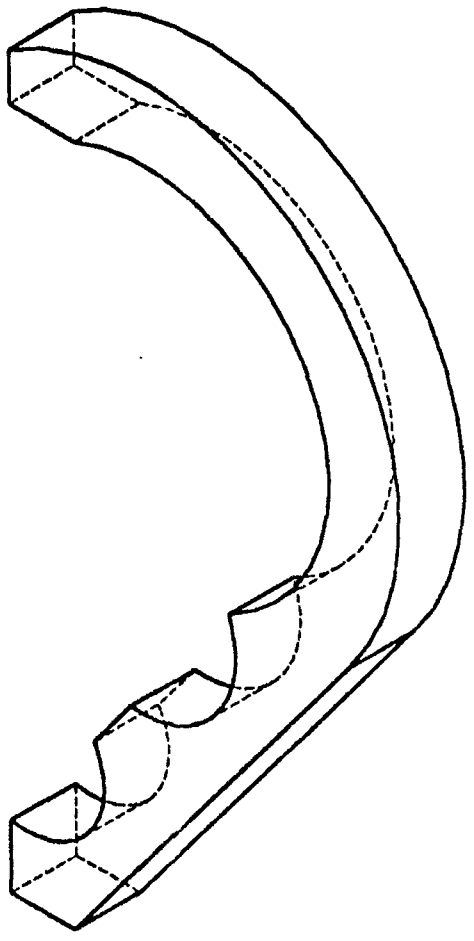

Figure : 1

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TYPE : STD

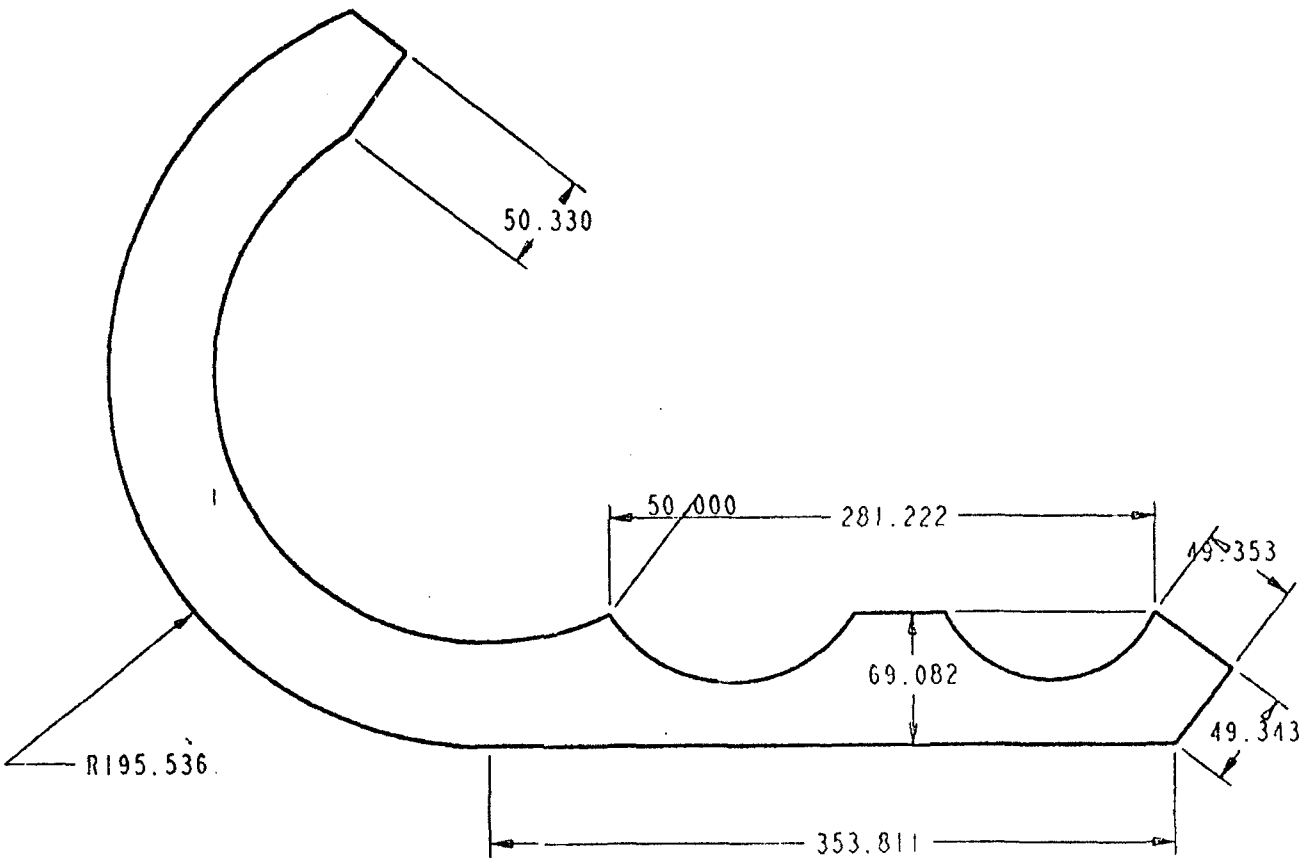


Figure: 2

NAME : CLIP

TYPE : STD

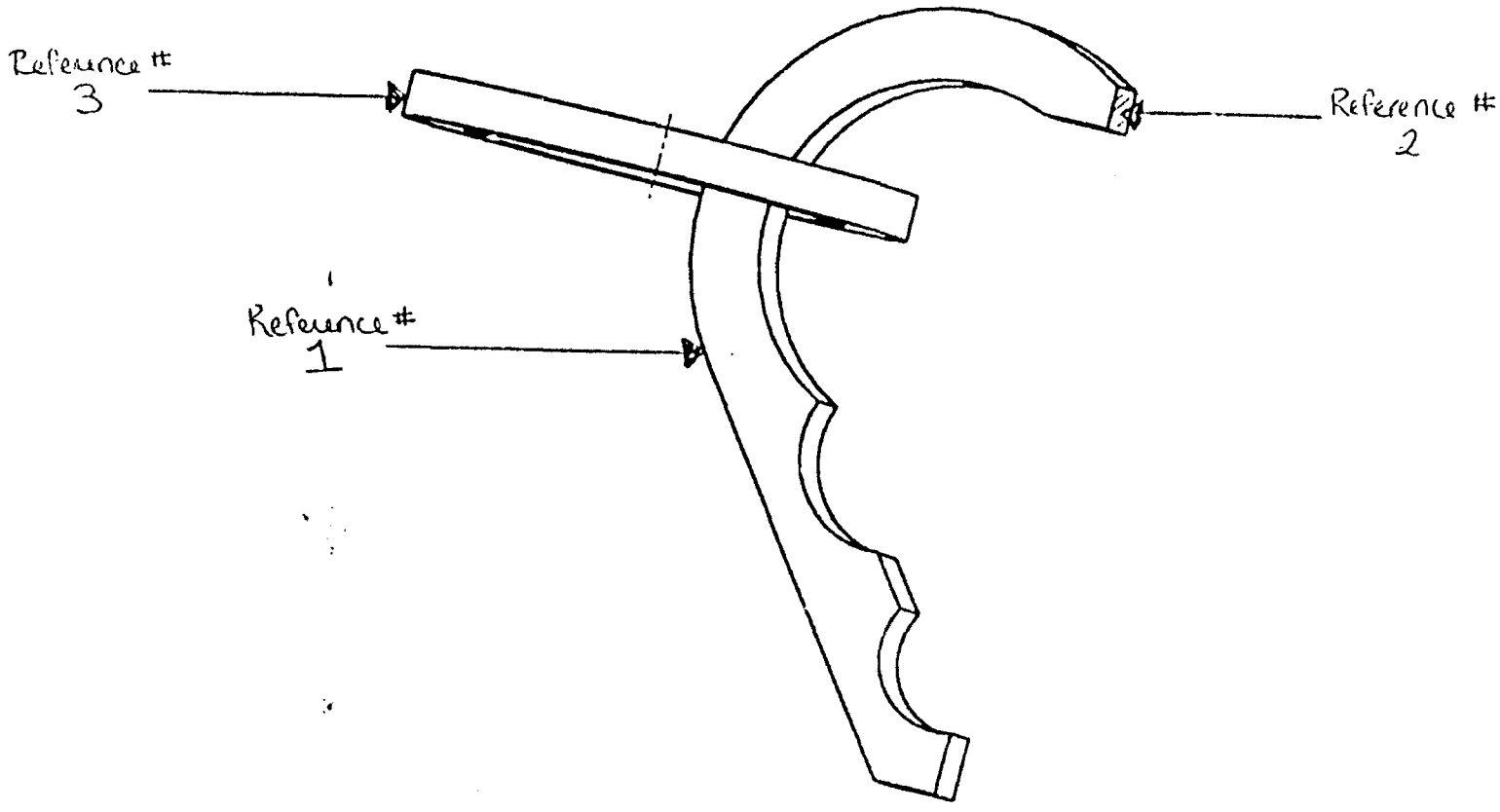
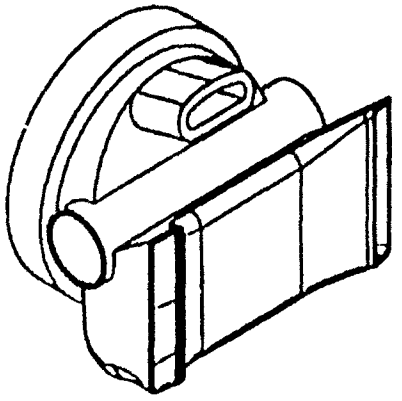
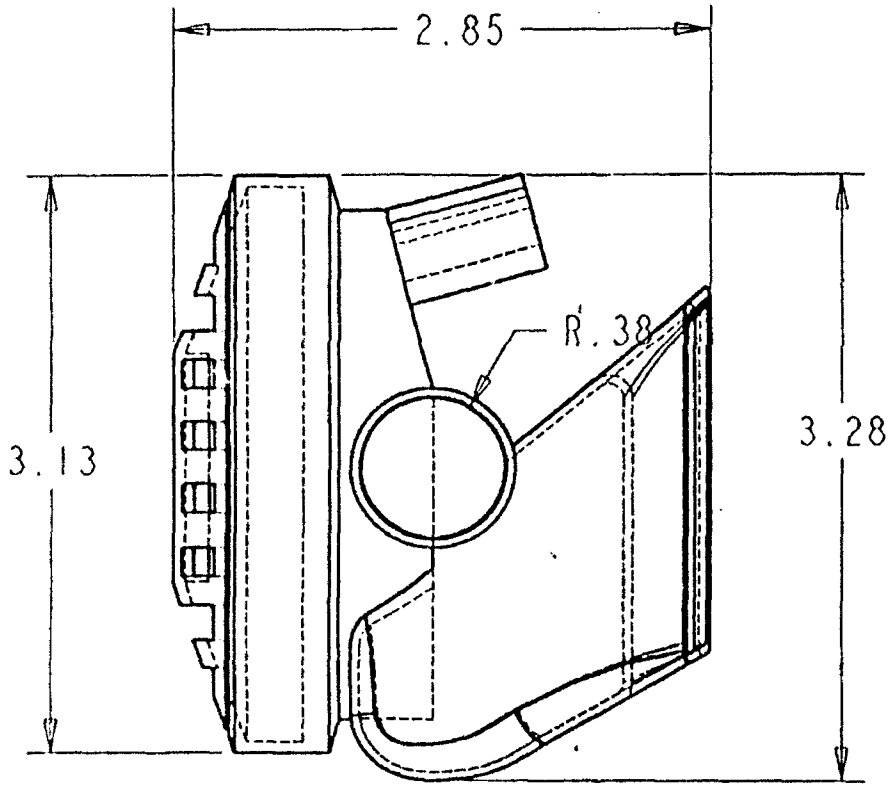
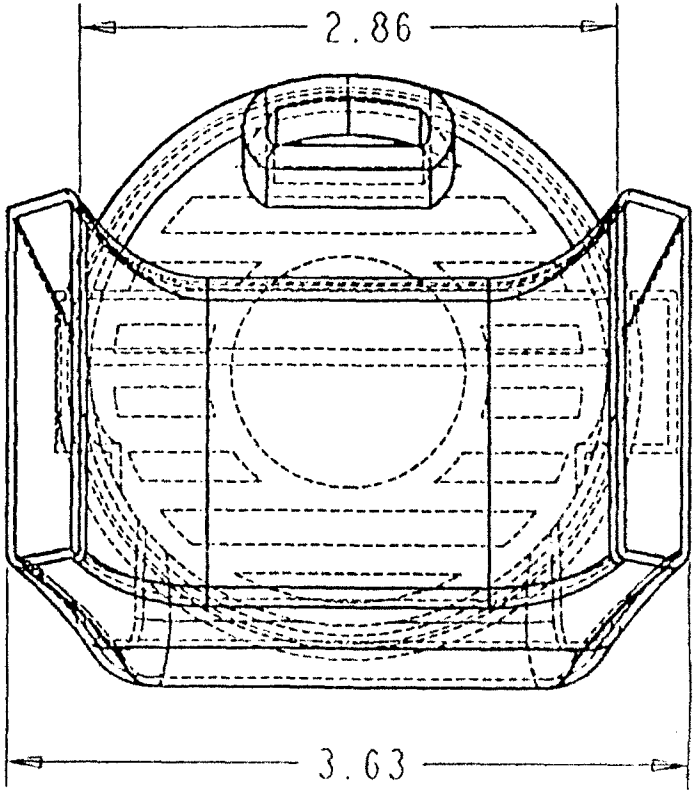


Figure 3







Rensselaer Polytechnic Institute	Title: Regulator	Dr By:	Date	Scale	Dwg #
		Appr By:	Date		

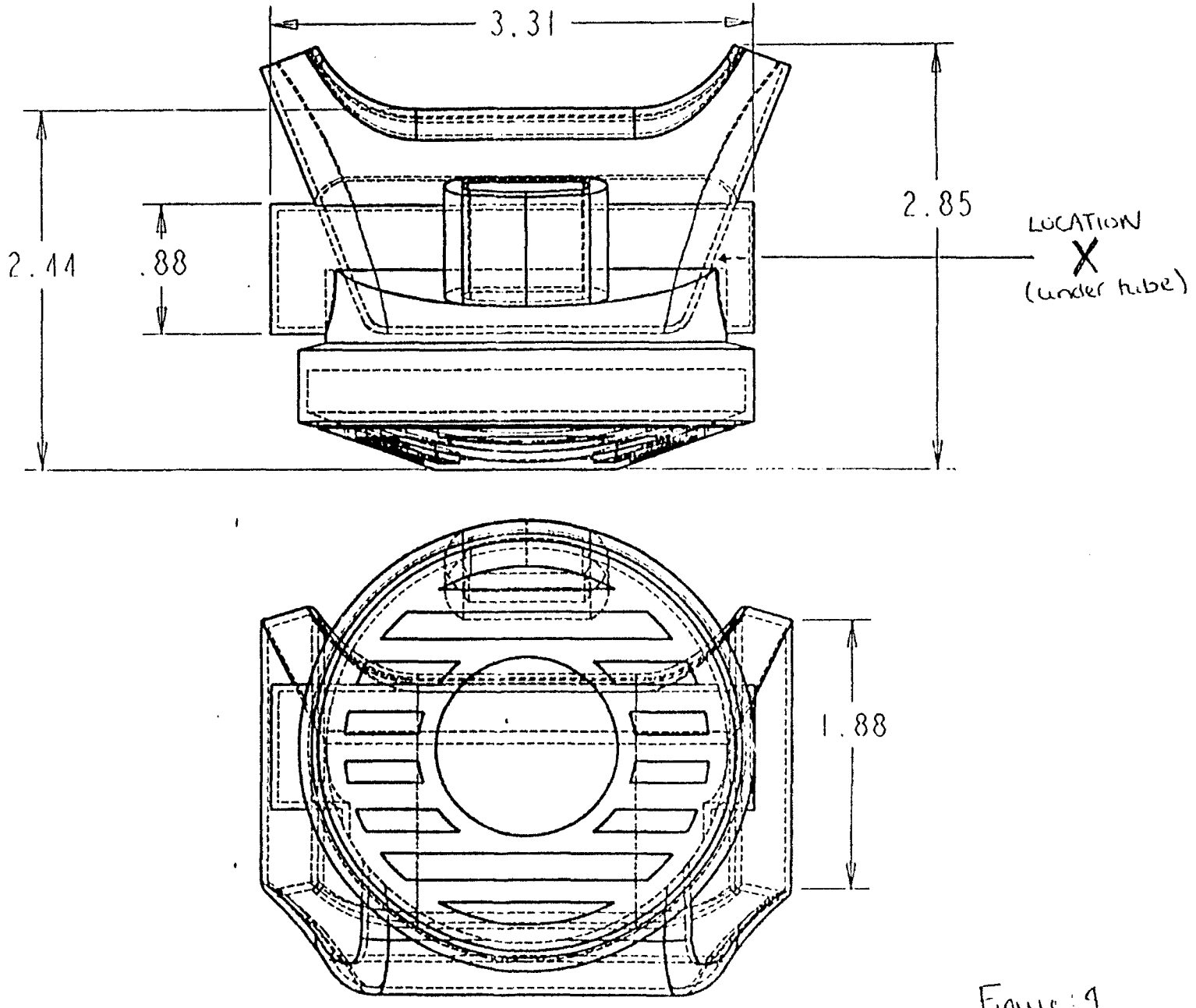


Figure 9

Rensselaer Polytechnic Institute	Title: Regulator	Dr By:	Date	Scale	DWG #
		Appr By:	Date		

Scuba Retainer Design

Dylan A. Thomas Memorial Preface
Program Engineering Team

Project Coordinators:

Aimee Matuszak

Meredith Morgan

Dylan A. Thomas Memorial Preface Program
Main Building
1066 Johnson Street
Troy, New York 12180-3590

Date: 22 July 1992

Subject: Scuba retainer design

Introduction:

This is a presentation of the newly designed retainer for the emergency respirator part of standard scuba diving equipment. Utilizing the productive expertise of the engineering team at the Dylan A. Thomas Memorial Preface Program, this innovative design will prove to be economical and more efficient than previous designs.

Our largest contractor of emergency regulator retainers in 1992 is Waterworld. World-wide, users of our contractors' completed scuba gear have complained of the annoyance the emergency respirator has caused. The previous retainer design has proven to be inefficient during prolonged use and is faulty concerning the forces acting on a diver during scuba activity. The previous design did not allow the regulator to be easily accessible. During an emergency, the previous design was often unreliable, frequently causing life-threatening situations.

The remodeled design presented in this report is easily accessible while being cost effective and able to withstand the pressure of impact with the surface of the water upon entry. The design is effective in retaining the regulator during rigorous underwater activity, a major complaint of the previous apparatus. The

new design allows for reliable mobility through any aquatic environment, keeping the regulator clean while still being easily accessible. Users of the previous design often complained of the high maintenance cost due to the deterioration of the apparatus after continual harsh exposure to the aquatic floors.

Enclosed in this report is a design description and assembly instructions. Included in the presentation package are illustrations of the new design and a Bill of Materials. This is the information needed for a sufficient understanding of the device created by the engineering team at the Dylan A. Thomas Memorial Preface Program. If questions should arise, please contract the coordinators at the above address.

Design Description:

The design for the component to be added to scuba diving equipment utilizing a steel oxygen tank consists of a magnetic box with dimensions 3.460 inches x 4.120 in. x 3.320 in. (refer to figure 1). The box, being a ceramic magnet, will withstand the pressures and drag forces prevalent during any scuba activity due to the strong attraction between the steel tank and the material of the magnetic box. The ceramic magnet will not corrode in either fresh or salt water environments.

Located on the side nearest to the diver (the side facing the direction of motion which the diver guides), exists a durable holding apparatus for the regulator allowing for easy entrance and removal of the device. On this side of the magnetic box, the surface has been removed and has been replaced with a rubber material serving as an inlet/outlet for the emergency regulator apparatus. This apparatus is located within a narrower frame of the magnetic box at a dimension of 0.06 cubic inches. The rubber material is arranged vertically from the top to the bottom of the box and serves as a woven passage strong enough to retain the regulator during rigorous underwater activity. The vertical dimension of the two rubber adjoinments is 2.90 inches, the horizontal is 3.21 in., the depth of each rubber section is 1.0 in, and the distance between each individual segment is 0.264 in. (refer to figures 2 and 3). The rubber interface is connected to the magnetic box with silicon which

acts as an effective support material and maintains it's structure and effectiveness in the water. The material is a stiff design that requires some force for entry and exiting. However, this force is not excessive but rather it is an effective strength to provide the holding interface between the magnetic box and the regulator.

Assembly Instructions:

1. The hollow, ceramic, magnetic box is to be 3.460 in. x 4.120 in. x 3.320 in. The magnetic strength of the box should be confirmed before distribution to public use. Should the strength be ineffective in maintaining a strong bond to the steel tank through scuba tests and environmental challenges, the product's magnetism should be increased.

2. The rubber interface consists of ten individual segments that together form the strong interface serving as the inlet/outlet for the regulator. Two sets of five segments each should be attached in a manner that allows the segments to compliment each other in position (that is, they are woven together in the opposite direction). The assembled interface is attached to the magnetic box 0.06 cubic inches within the entrance to the open surface by means of silicon gel capable of withstanding the harsh environment of the waters and serving as a reliable and durable connecting material (refer to figure 4).

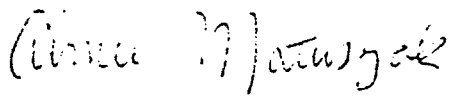
3. A final confirmation of the magnetism of the box and it's ability to retain the regulator with a firm grasp should be completed before the box is introduced to the general public.

Conclusion:

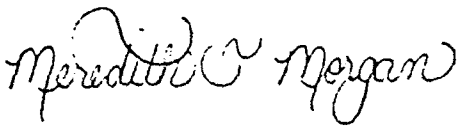
This is the presentation of a newly-modeled retainer for the emergency regulator part of standard scuba diving equipment. Presented by the Dylan A. Thomas Memorial Preface Program team of engineers, this design is more effective in storing the emergency regulator for easy accessibility to both the diver and partner team. The magnetic box is a reliable retainer that adapts to the aquatic environment sufficiently, it is economical, and it is a simple design ideal for mass production and distribution.

Once again, should questions arise concerning the design, please contact the Preface engineering team.

Aimee Matuszak



Meredith Morgan



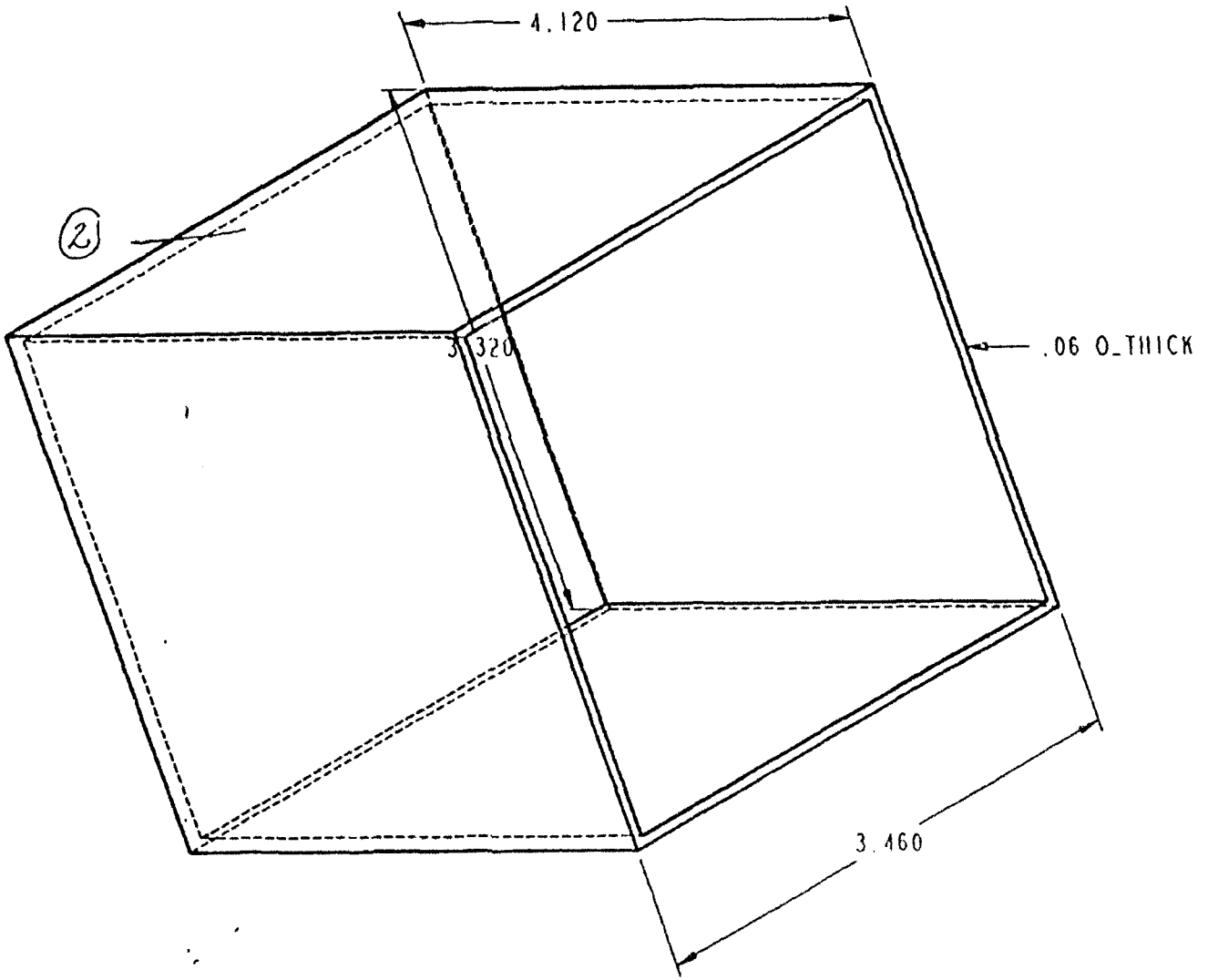
Project Coordinators

Bill of Materials

Scuba Retainer Design

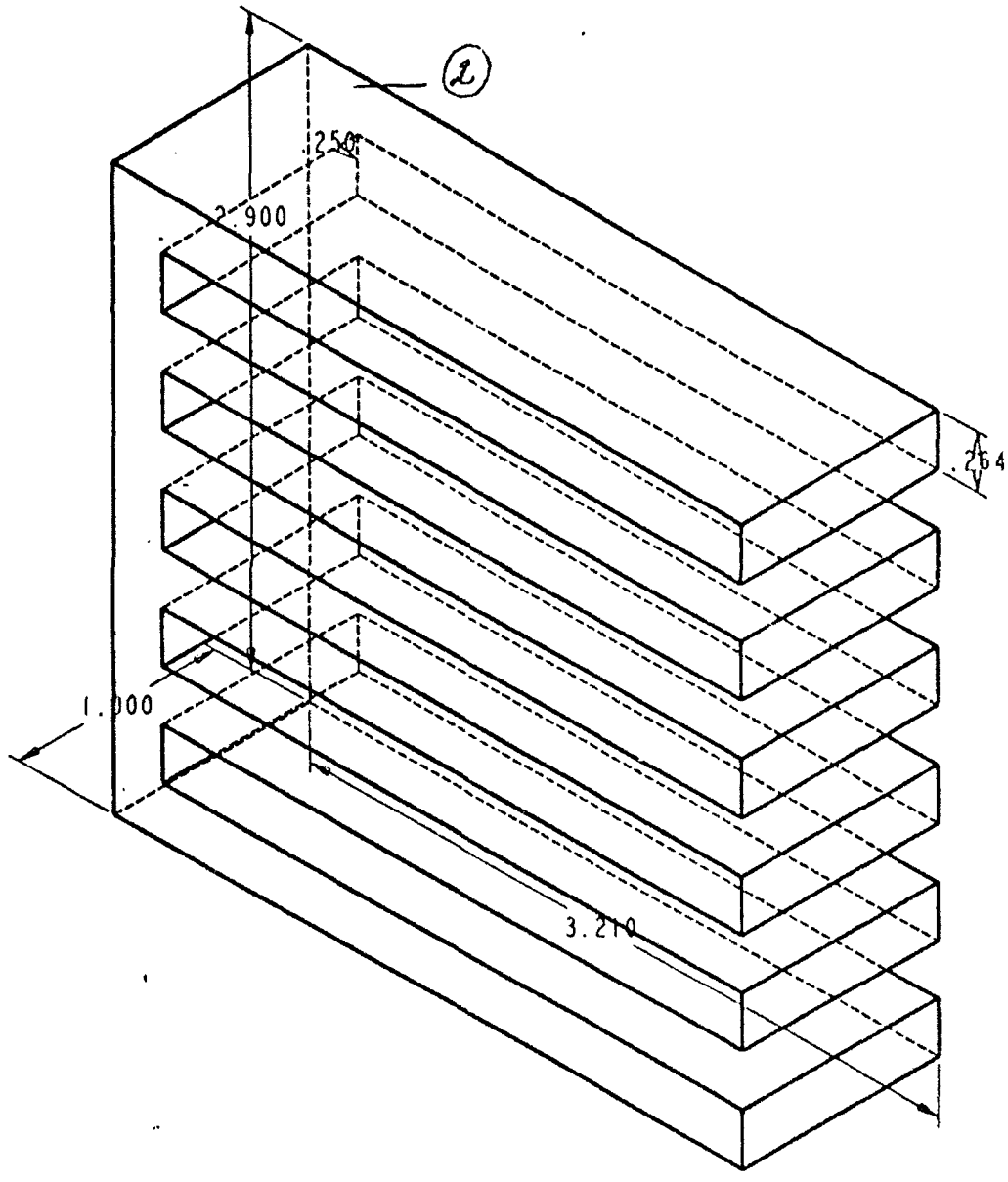
Dylan A. Thomas Memorial Preface Engineering Team

Reference Number	Quantity	Part Designation	Material
1	2	Interface	Rubber
2	1	Magnetic Box	Ceramic Magnet



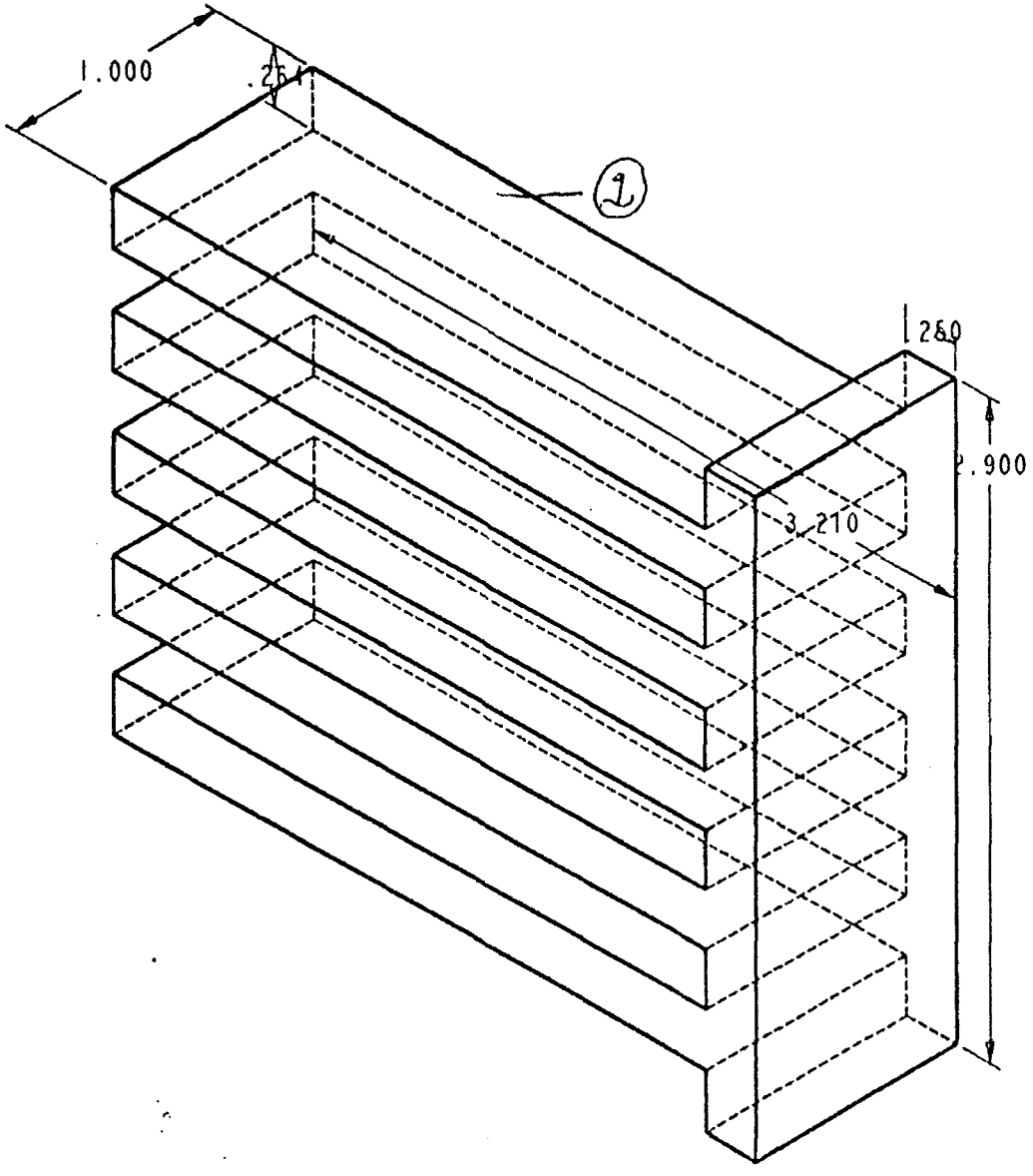
NAME : DESIGN
TYPE : STD

Figure 1.



NAME : FINGER1
TYPE : STD

Figure 2



NAME : FINGER2
TYPE : STD

Figure 3

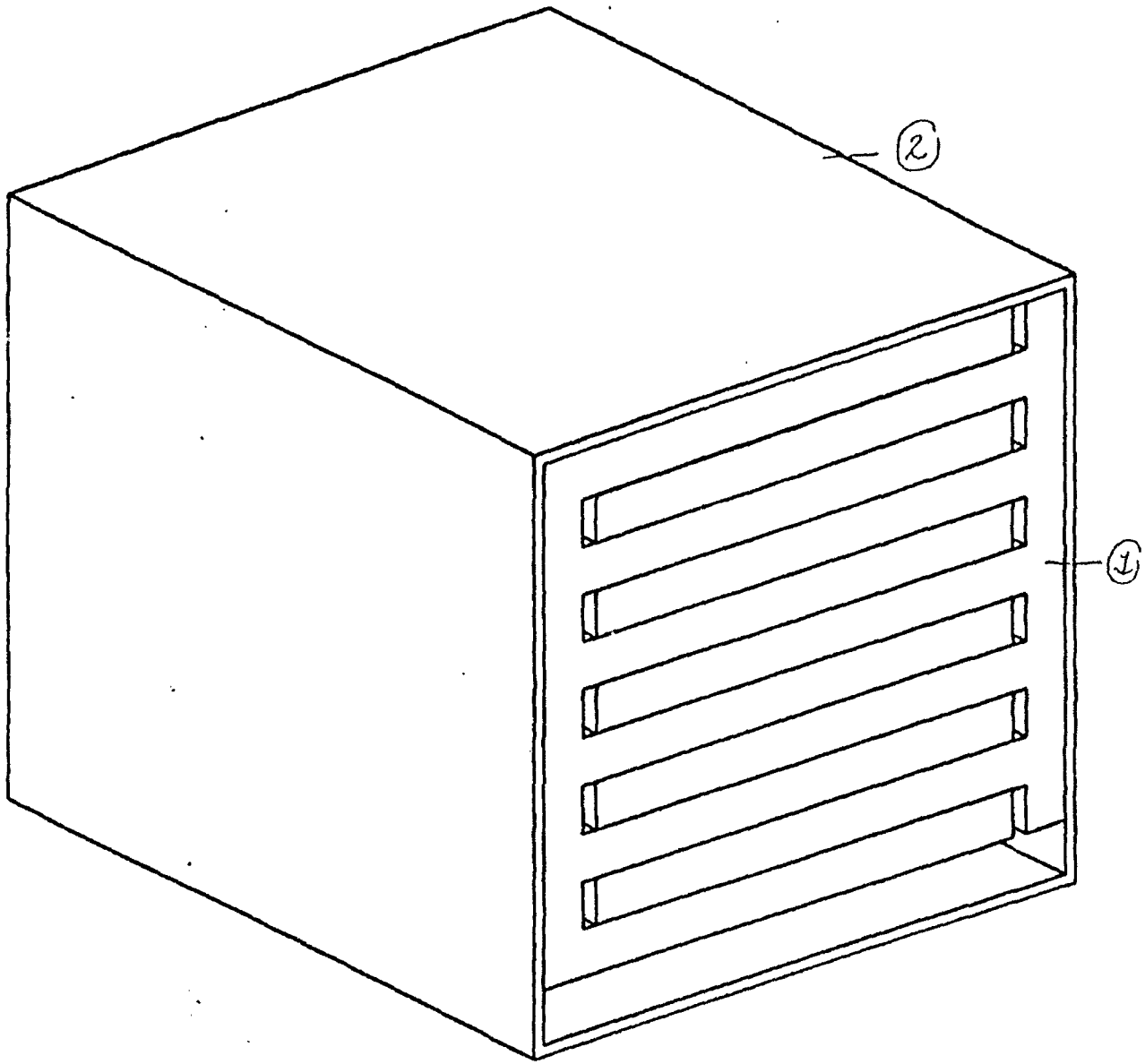


Figure 4